



SEQUENCE LISTING

<110> Lo, Reggie Y.C.
Schryvers, Anthony B.
Potter, Andrew A.

<120> TRANSFERRIN BINDING PROTEINS OF
PASTEURILLA HAEMOLYTICA AND VACCINES CONTAINING THE SAME

<130> A34762 021645.0105

<140> 08/753,759

<141> 1996-11-29

<150> CA 2,164,274

<151> 1995-12-01

<150> 60/008,569

<151> 1995-12-01

<160> 68

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 2793

<212> DNA

<213> Pasteurella haemolytica

<220>

<221> misc_feature

<222> 2544

<223> a, c, g or t

<400> 1

atgataatga aatatcatca ttttcgctat tcacctgttg ccttaacagt gttatttgct 60
ctttctcatt catacggtgc tgcgactgaa aataaaaaaa tcgaagaaaa taacgatcta 120
gctgttctgg atgaagttat tgtgacagag agccattatg ctcacgaacg tcaaaacgaa 180
gtaactggct tggggaaagt agtgaaaaat tatcacgaaa tgagtaaaaa tcaaattctt 240
ggtattcgtg atttaactcg ctatgaccct ggtatttcgg tgggtggaaca aggtcgcggt 300
gcaagtagtg gctatgccat tcgagggtga gataaaaacc gtgtcagctt acttgttgat 360
gggctaccac aagcgcacag ttatcatagc ctaggttcag atgctaattg tgggtgcaatt 420
aatgagattg agtatgaaaa cattcggttca attgagttaa gcaaaggagc aagttctgctg 480
gaatatggct ctggtgcgca tgggtggtgct attggttttc gtactaaaga tgcgcaggat 540
attattaaag aggggcagca ttggggctta gatagtaaga cctcttatgc cagcaaaaat 600
agccattttt tacagtctat cgcagcggct ggtgaggcgg gtggttttga agcacttggt 660
attgcaactc accgacacgg taaagagacc aaaattcatt ccgaggcaaa taaattaaaa 720
cataatatcc ggcgtataac cggctttgaa aatcgctacg actttaccba aattccgcac 780

agaatgctcc tggaggatct cctttttaatt gtggaagata cttgcccac attagattgt 840
 actcctcgtg caagggttaa gttgaaccgc gataatttcc cagtgagaac atttccggaa 900
 tatacgctg aagagcgcaa acagcttgag cagattcctt atcgactga gcagctctca 960
 gcccaagaat ataccggtaa agatcgcat gcaccaaac ctttagatta caagagtaat 1020
 tctgttttta tgaagtttgg ctatcacttc aactcgtctc attatcttgg cgcaatctta 1080
 gaagatacaa aaacacgcta cgatatccgt gatatgcaaa cgccagctta ctatacaaaa 1140
 gacgatatta acttatcact taggaactat gtttatgaag gggataatat tttagatggc 1200
 ttagtgttca agccaaggat cccttatggg ttgcgctata gccatgtgaa gttttttgat 1260
 gaacgtcacc acaaacgtcg tttaggattc acctataaat ataaaccaga gaataatcgc 1320
 tggttggata gcattaaact cagtgcggat aaacaagata ttgaactata tagccggcta 1380
 catcgcttgc attgtagcga ttatcctgtg gtagataaaa attgccgccc gactttggat 1440
 aaatcttggg ctatgtatcg aactgagcgt aataattacc aagaaaagca tcgtgtcatt 1500
 catttagaat ttgataaagc gctaaatgct ggtcaaggcg tatttaacca aaccacaaa 1560
 ctgaatttag ggttgggctt tgatcgattt aattcgctta tggatcatgg ggatagtact 1620
 gcccaatata ccaaaggcgg ttataaccagc taccgcggtg gagggcggtt agataatcca 1680
 tatattttatc gccgcgatcc acgcagtatt gaaacggtat ctttgtgtaa taatacacgc 1740
 ggcgacatct taaactgtga accgcgtaaa attaaaggcg atagccattt tgtagcttc 1800
 cgcgatctag tgataagcga gtatgtggat ttgggattag ggggtgcgtt tgatcaacat 1860
 cgatttaaat ctgatgatcc gtggacactt agccgaactt atcgaaattg gtcttggaa 1920
 ggtgggatta cgcttaaac aacagagttt gtatcgctt cttatcgcat ttcaaacggt 1980
 tttagagtgc ctgcattcta tgaactttat ggtaaactgt atcatattgg gcttaaagat 2040
 aacgaatatg tgcaacgcgc gcaacgtagc caccagttag agccagaaaa atcgactaat 2100
 catgagattg gagtttagctt taaagggtcaa tttggttacc ttgatgtgag ctatttccgt 2160
 aataactata aaaatatgat tgcgacagca tgtaaaagaa taatacaaaa atcacactgt 2220
 ttctataact accataatat tcaagatgta gcactaaacg ggataaattt agtcgctaaa 2280
 tttgacttac acggtatttt atctatgctg ccagatgggt tttattcatc agttgcttat 2340
 aaccgtgtaa aagtaaaaga gcggaaacta accgactcaa gactcgatag cgtaaacgat 2400
 cctattctag atgcgattca gccagcacgc tatgtgcttg gattcggcta cgatcaccca 2460
 gaagaaaaat ggggaattgg cattaactacc acctattcta agccaaaaa cgccgatgag 2520
 gtggcaggca cacgtcatca cggatatacat cgcgttgatt taggtggcaa actgaccggt 2580
 tcttggtaca cccatgatat tacgggttac atcaattata aaaactacac cttacgtgga 2640
 ggaatttata atgtgactaa tcgtaaatat tccacttggg aatcagtgcg ccaatccggt 2700
 gtgaatgcag taaaccaaga ccggggtagc aattacactc gatttggcgc tccggggaga 2760
 aatttcagtt tagcatttga aatgaagttt tag 2793

<210> 2

<211> 930

<212> PRT

<213> Pasteurella haemolytica

<400> 2

Met	Ile	Met	Lys	Tyr	His	His	Phe	Arg	Tyr	Ser	Pro	Val	Ala	Leu	Thr
1			5					10						15	
Val	Leu	Phe	Ala	Leu	Ser	His	Ser	Tyr	Gly	Ala	Ala	Thr	Glu	Asn	Lys
			20					25					30		
Lys	Ile	Glu	Glu	Asn	Asn	Asp	Leu	Ala	Val	Leu	Asp	Glu	Val	Ile	Val
		35					40					45			
Thr	Glu	Ser	His	Tyr	Ala	His	Glu	Arg	Gln	Asn	Glu	Val	Thr	Gly	Leu
	50					55					60				
Gly	Lys	Val	Val	Lys	Asn	Tyr	His	Glu	Met	Ser	Lys	Asn	Gln	Ile	Leu

65 70 75 80
 Gly Ile Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile Ser Val Val Glu
 85 90 95
 Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ala Ile Arg Gly Val Asp Lys
 100 105 110
 Asn Arg Val Ser Leu Leu Val Asp Gly Leu Pro Gln Ala His Ser Tyr
 115 120 125
 His Thr Leu Gly Ser Asp Ala Asn Gly Gly Ala Ile Asn Glu Ile Glu
 130 135 140
 Tyr Glu Asn Ile Arg Ser Ile Glu Leu Ser Lys Gly Ala Ser Ser Ala
 145 150 155 160
 Glu Tyr Gly Ser Gly Ala His Gly Gly Ala Ile Gly Phe Arg Thr Lys
 165 170 175
 Asp Ala Gln Asp Ile Ile Lys Glu Gly Gln His Trp Gly Leu Asp Ser
 180 185 190
 Lys Thr Ser Tyr Ala Ser Lys Asn Ser His Phe Leu Gln Ser Ile Ala
 195 200 205
 Ala Ala Gly Glu Ala Gly Gly Phe Glu Ala Leu Val Ile Ala Thr His
 210 215 220
 Arg His Gly Lys Glu Thr Lys Ile His Ser Glu Ala Asn Lys Leu Lys
 225 230 235 240
 His Asn Ile Arg Arg Ile Thr Gly Phe Glu Asn Arg Tyr Asp Phe Thr
 245 250 255
 Gln Ile Pro His Arg Met Leu Leu Glu Asp Leu Leu Leu Ile Val Glu
 260 265 270
 Asp Thr Cys Pro Thr Leu Asp Cys Thr Pro Arg Ala Arg Val Lys Leu
 275 280 285
 Asn Arg Asp Asn Phe Pro Val Arg Thr Phe Pro Glu Tyr Thr Pro Glu
 290 295 300
 Glu Arg Lys Gln Leu Glu Gln Ile Pro Tyr Arg Thr Glu Gln Leu Ser
 305 310 315 320
 Ala Gln Glu Tyr Thr Gly Lys Asp Arg Ile Ala Pro Asn Pro Leu Asp
 325 330 335
 Tyr Lys Ser Asn Ser Val Phe Met Lys Phe Gly Tyr His Phe Asn Ser
 340 345 350
 Ser His Tyr Leu Gly Ala Ile Leu Glu Asp Thr Lys Thr Arg Tyr Asp
 355 360 365
 Ile Arg Asp Met Gln Thr Pro Ala Tyr Tyr Thr Lys Asp Asp Ile Asn
 370 375 380
 Leu Ser Leu Arg Asn Tyr Val Tyr Glu Gly Asp Asn Ile Leu Asp Gly
 385 390 395 400
 Leu Val Phe Lys Pro Arg Ile Pro Tyr Gly Leu Arg Tyr Ser His Val
 405 410 415
 Lys Phe Phe Asp Glu Arg His His Lys Arg Arg Leu Gly Phe Thr Tyr
 420 425 430
 Lys Tyr Lys Pro Glu Asn Asn Arg Trp Leu Asp Ser Ile Lys Leu Ser
 435 440 445
 Ala Asp Lys Gln Asp Ile Glu Leu Tyr Ser Arg Leu His Arg Leu His
 450 455 460
 Cys Ser Asp Tyr Pro Val Val Asp Lys Asn Cys Arg Pro Thr Leu Asp

H3
 cd

465					470					475					480
Lys	Ser	Trp	Ser	Met	Tyr	Arg	Thr	Glu	Arg	Asn	Asn	Tyr	Gln	Glu	Lys
				485					490					495	
His	Arg	Val	Ile	His	Leu	Glu	Phe	Asp	Lys	Ala	Leu	Asn	Ala	Gly	Gln
			500					505					510		
Gly	Val	Phe	Asn	Gln	Thr	His	Lys	Leu	Asn	Leu	Gly	Leu	Gly	Phe	Asp
		515					520					525			
Arg	Phe	Asn	Ser	Leu	Met	Asp	His	Gly	Asp	Met	Thr	Ala	Gln	Tyr	Thr
	530					535					540				
Lys	Gly	Gly	Tyr	Thr	Ser	Tyr	Arg	Gly	Arg	Gly	Arg	Leu	Asp	Asn	Pro
545					550					555					560
Tyr	Ile	Tyr	Arg	Arg	Asp	Pro	Arg	Ser	Ile	Glu	Thr	Val	Ser	Leu	Cys
				565					570					575	
Asn	Asn	Thr	Arg	Gly	Asp	Ile	Leu	Asn	Cys	Glu	Pro	Arg	Lys	Ile	Lys
			580					585					590		
Gly	Asp	Ser	His	Phe	Val	Ser	Phe	Arg	Asp	Leu	Val	Ile	Ser	Glu	Tyr
	595						600					605			
Val	Asp	Leu	Gly	Leu	Gly	Val	Arg	Phe	Asp	Gln	His	Arg	Phe	Lys	Ser
	610					615					620				
Asp	Asp	Pro	Trp	Thr	Leu	Ser	Arg	Thr	Tyr	Arg	Asn	Trp	Ser	Trp	Asn
625					630					635					640
Gly	Gly	Ile	Thr	Leu	Lys	Pro	Thr	Glu	Phe	Val	Ser	Leu	Ser	Tyr	Arg
				645					650					655	
Ile	Ser	Asn	Gly	Phe	Arg	Val	Pro	Ala	Phe	Tyr	Glu	Leu	Tyr	Gly	Lys
			660					665					670		
Arg	Asp	His	Ile	Gly	Leu	Lys	Asp	Asn	Glu	Tyr	Val	Gln	Arg	Ala	Gln
	675						680					685			
Arg	Ser	His	Gln	Leu	Glu	Pro	Glu	Lys	Ser	Thr	Asn	His	Glu	Ile	Gly
	690					695					700				
Val	Ser	Phe	Lys	Gly	Gln	Phe	Gly	Tyr	Leu	Asp	Val	Ser	Tyr	Phe	Arg
705					710					715					720
Asn	Asn	Tyr	Lys	Asn	Met	Ile	Ala	Thr	Ala	Cys	Lys	Arg	Ile	Ile	Gln
				725					730					735	
Lys	Ser	His	Cys	Phe	Tyr	Asn	Tyr	His	Asn	Ile	Gln	Asp	Val	Ala	Leu
			740					745					750		
Asn	Gly	Ile	Asn	Leu	Val	Ala	Lys	Phe	Asp	Leu	His	Gly	Ile	Leu	Ser
	755						760					765			
Met	Leu	Pro	Asp	Gly	Phe	Tyr	Ser	Ser	Val	Ala	Tyr	Asn	Arg	Val	Lys
	770					775					780				
Val	Lys	Glu	Arg	Lys	Leu	Thr	Asp	Ser	Arg	Leu	Asp	Ser	Val	Asn	Asp
785					790					795					800
Pro	Ile	Leu	Asp	Ala	Ile	Gln	Pro	Ala	Arg	Tyr	Val	Leu	Gly	Phe	Gly
				805					810					815	
Tyr	Asp	His	Pro	Glu	Glu	Lys	Trp	Gly	Ile	Gly	Ile	Thr	Thr	Thr	Tyr
			820					825					830		
Ser	Lys	Ala	Lys	Asn	Ala	Asp	Glu	Val	Ala	Gly	Thr	Arg	His	His	Gly
	835					840						845			
Ile	His	Arg	Val	Asp	Leu	Gly	Gly	Lys	Leu	Thr	Gly	Ser	Trp	Tyr	Thr
	850					855					860				
His	Asp	Ile	Thr	Gly	Tyr	Ile	Asn	Tyr	Lys	Asn	Tyr	Thr	Leu	Arg	Gly

43
cl

865 870 875 880
 Gly Ile Tyr Asn Val Thr Asn Arg Lys Tyr Ser Thr Trp Glu Ser Val
 885 890 895
 Arg Gln Ser Gly Val Asn Ala Val Asn Gln Asp Arg Gly Ser Asn Tyr
 900 905 910
 Thr Arg Phe Gly Ala Pro Gly Arg Asn Phe Ser Leu Ala Phe Glu Met
 915 920 925
 Lys Phe
 930

<210> 3
 <211> 1755
 <212> DNA
 <213> Pasteurella haemolytica

43
 4d

<400> 3
 atgtttaaac ttaaaagtag ttttgtactg cttaatgCGG cgctacttgc tgcttggtcc 60
 tcaaatggtg gaagctttga tgttcaatct gccaaagtGg aatctcaaac gcaaactacc 120
 cccaaaaagc caagttttaca agatgataat agtaacgcaa gacgtacagt aagcgcttct 180
 gaaactgaag ctttattgca gccgggggtt ggtttttcag ccaaaattcc gcgtcgtaat 240
 ctccctccgc aggggaagga agatgtagcc cctattgggtg atataaaaga gattactgga 300
 gatctgccaa aaattccgta tgaagaagag gttaaagcgt gcggtagtag tgctgatgga 360
 tttagccata ctcatgatag aaatcataag ttgtatacaa gagattttaa ttttgttcgt 420
 tccggctatg ttgtgcattc tgggtccaaa cctgaaataa agcctaaaga aattttgaga 480
 acaggtgcac atgggtatgt ttactattta ggtatagagc cgcccaaagc aatacctacc 540
 caaaaactaa cttataaagg atattgggat ttactacct atgCGgctaa ggggagagat 600
 agtaatatTT ttctaattcc cgcaggcatc aatagtggcg ccataaccgga aaatagtcac 660
 gatattaatg ttgatgatc tgaaaaacca atggggcata caggagaatt tacggctgat 720
 tttgctaata aaactttaac tggaaacattg gttcgtaatg ggtatgtag tcgtagcaaa 780
 gagcaaaaaa ttacaacaat ttacgatatt gatgcgaaaa tttaaaggtaa tcgcttttct 840
 ggtaaagcaa acccaaaaaa accgatgatc cttatttttg ggaaaagctc cacgacactt 900
 gaaggtggat tttttgggtg ggaggctcaa gaacttgCGg gtaaattcct agctgatgat 960
 aagtcggtat ttgttgTTTT tgctggcaca cgagatgcta aaaaagatga tagtgaatct 1020
 gcctttgatg ctttcccaat taaacttaaa gatttaaata aatctgagat ggatactttc 1080
 gggaatgcga cacatttgat tattaacaat aagcagattc cacttattgc ggaagccaca 1140
 aaaagctttg ccgagatgaa atttgatgat ttggttaccg gtactattga tggaaaaacg 1200
 tatcgagttt cagtctgctg taataattta gattatgtca aatttgggat ttatagcgag 1260
 ggaaataata gtgatactgc tctccaagaa tatttagtag gagaacgtac agctctggca 1320
 gatttgccaa cagggacagt aaaatatcga ggtacttggg acggggtaat gtacagtaaa 1380
 tctggctcgg caggggttga atcgccaagt aacagcgaaa gtggtactcg ttactattc 1440
 gatgtagatt ttgtcaataa aaaaattaat ggcaagctga ttgctaataa tgggtttgaa 1500
 gaacgccccaa tgctgacact ggaaggcaat ctgaaaggga atggttttgg aggcacagcc 1560
 aaaacgggca attctggttt taatcttgat cccaaaagta cgaatgggtg cacggtaggg 1620
 catataaata ctcaatttga agggggcttt tatggcccta aggcgacgga attaggtggt 1680
 attgtacaaa atacagaaac ggataaagat agagtcaGta ttacattcgg cggaaaacgt 1740
 caaatagaaa aataa 1755

<210> 4
 <211> 584

<212> PRT

<213> Pasteurella haemolytica

<400> 4

Met Phe Lys Leu Lys Ser Ser Phe Val Leu Leu Asn Ala Ala Leu Leu
1 5 10 15
Ala Ala Cys Ser Ser Asn Gly Gly Ser Phe Asp Val Gln Ser Ala Lys
20 25 30
Val Glu Ser Gln Thr Gln Thr Thr Pro Lys Lys Pro Ser Leu Gln Asp
35 40 45
Asp Asn Ser Asn Ala Arg Arg Thr Val Ser Ala Ser Glu Thr Glu Ala
50 55 60
Leu Leu Gln Pro Gly Phe Gly Phe Ser Ala Lys Ile Pro Arg Arg Asn
65 70 75 80
Leu Leu Pro Gln Gly Lys Glu Asp Val Ala Pro Ile Gly Asp Ile Lys
85 90 95
Glu Ile Thr Gly Asp Leu Pro Lys Ile Pro Tyr Glu Glu Glu Val Lys
100 105 110
Ala Cys Gly Ser Ser Ala Asp Gly Phe Ser His Thr His Asp Arg Asn
115 120 125
His Lys Leu Tyr Thr Arg Asp Phe Asn Phe Val Arg Ser Gly Tyr Val
130 135 140
Val His Ser Gly Pro Lys Pro Glu Ile Lys Pro Lys Glu Ile Leu Arg
145 150 155 160
Thr Gly Ala His Gly Tyr Val Tyr Tyr Leu Gly Ile Glu Pro Pro Lys
165 170 175
Ala Ile Pro Thr Gln Lys Leu Thr Tyr Lys Gly Tyr Trp Asp Phe Thr
180 185 190
Thr Tyr Ala Ala Lys Gly Arg Asp Ser Asn Ile Phe Leu Ile Pro Ala
195 200 205
Gly Ile Asn Ser Gly Ala Ile Pro Glu Asn Ser His Asp Ile Asn Val
210 215 220
Asp Asp Ser Glu Lys Pro Met Gly His Thr Gly Glu Phe Thr Ala Asp
225 230 235 240
Phe Ala Asn Lys Thr Leu Thr Gly Thr Leu Val Arg Asn Gly Tyr Val
245 250 255
Ser Arg Ser Lys Glu Gln Lys Ile Thr Thr Ile Tyr Asp Ile Asp Ala
260 265 270
Lys Ile Lys Gly Asn Arg Phe Ser Gly Lys Ala Asn Pro Lys Lys Pro
275 280 285
Met Ile Leu Ile Phe Gly Lys Ser Ser Thr Thr Leu Glu Gly Gly Phe
290 295 300
Phe Gly Gly Glu Ala Gln Glu Leu Ala Gly Lys Phe Leu Ala Asp Asp
305 310 315 320
Lys Ser Val Phe Val Val Phe Ala Gly Thr Arg Asp Ala Lys Lys Asp
325 330 335
Asp Ser Glu Ser Ala Phe Asp Ala Phe Pro Ile Lys Leu Lys Asp Leu
340 345 350
Asn Lys Ser Glu Met Asp Thr Phe Gly Asn Ala Thr His Leu Ile Ile
355 360 365

Asn Asn Lys Gln Ile Pro Leu Ile Ala Glu Ala Thr Lys Ser Phe Ala
 370 375 380
 Glu Met Lys Phe Asp Asp Leu Val Thr Arg Thr Ile Asp Gly Lys Thr
 385 390 395 400
 Tyr Arg Val Ser Val Cys Cys Asn Asn Leu Asp Tyr Val Lys Phe Gly
 405 410 415
 Ile Tyr Ser Glu Gly Asn Asn Ser Asp Thr Ala Leu Gln Glu Tyr Leu
 420 425 430
 Val Gly Glu Arg Thr Ala Leu Ala Asp Leu Pro Thr Gly Thr Val Lys
 435 440 445
 Tyr Arg Gly Thr Trp Asp Gly Val Met Tyr Ser Lys Ser Gly Ser Ala
 450 455 460
 Gly Val Glu Ser Pro Ser Asn Ser Glu Ser Gly Thr Arg Ser Leu Phe
 465 470 475 480
 Asp Val Asp Phe Val Asn Lys Lys Ile Asn Gly Lys Leu Ile Ala Asn
 485 490 495
 Asp Gly Val Glu Glu Arg Pro Met Leu Thr Leu Glu Gly Asn Leu Lys
 500 505 510
 Gly Asn Gly Phe Gly Gly Thr Ala Lys Thr Gly Asn Ser Gly Phe Asn
 515 520 525
 Leu Asp Pro Lys Ser Thr Asn Gly Gly Thr Val Gly His Ile Asn Thr
 530 535 540
 Gln Phe Glu Gly Gly Phe Tyr Gly Pro Lys Ala Thr Glu Leu Gly Gly
 545 550 555 560
 Ile Val Gln Asn Thr Glu Thr Asp Lys Asp Arg Val Ser Ile Thr Phe
 565 570 575
 Gly Gly Lys Arg Gln Ile Glu Lys
 580

<210> 5
 <211> 2045
 <212> DNA
 <213> Pasteurella haemolytica

<400> 5
 cgcttgacaga tttgtaaaaa atttagctaa aatcagacct ggcttgtatt ttaggggttat 60
 tatggaacag acaacggaac aaatagatta taaattatta aagcatcggt ttcgtgggcta 120
 tttaccgctt gtgattgatg tggaacagag gcttaaatgc ccaaactgtg ccttattgga 180
 attggccgga attactttta aattggacga gccaaaggta tcttattgcc ggattcaaca 240
 atgccaattt ccaatttgcg gccattggag ggggcgattt tcaagggccg aatatttacc 300
 ctcatgcatt aaaattcaac ggcattcata ttcacaaccc tctagaggaa gcggtttaga 360
 gaatattgcc caattcccgg aaatgttcaa aatgggttcg aaagcaatga aggaagcaag 420
 gctgccaacg ggcggtgatt gttgccccac aatgccagcg ttcgatcagg gcttttttac 480
 agggctgcga ttaaaccgaa tgccaagcga gagatccctt tcaccctttt ggcgatgttt 540
 gactaccgcc gccacccttt gcaggtttta tgttatgggc aaaccgtgtt cgttaaaagc 600
 ctgccagtgc aaaatccggt cacgtagcag cactataggg cgaattgggt accgggcccc 660
 cctcgaggtc gacggtatcg ataaagcttc atatcgaatt cctgcagccc gggggatccg 720
 atgcgccttg cggctcaagt tattagtggc atcgggtttt tgggtgatgg tgtcattttg 780
 cataagaaaa atgatgcgat ttcaggttta cccactgcgg cgattatttg ggcttctgcg 840

gggatcggta	ttgctgcagg	ggaggggtttc	gtggtttcatg	cgggtcatcgc	caactgtcatt	900
attttggtgt	ctattcgtatt	atgtccgttg	gttcaacggt	gggttcacgc	taaatcacaa	960
cgctgcgcac	gaaatattct	tgtcaatgat	gcggaaagca	tacggaaagt	taccaattg	1020
ttattcaata	atcagtatcg	tattgaacat	atacaagtca	aagatcaaag	tagtggagaa	1080
gttgccgggt	acaaattcgt	attgattcca	caatgttcaa	agatgcgtat	gctttactta	1140
aagcagaaga	tggcgaatac	tgttcaagta	gatatcatga	aaaagagtgc	ttatattcaa	1200
tttttttatt	tttatttaaat	ttctttccac	aaaagatcat	tttcaattat	atatactgga	1260
attttgcctt	acgctatctg	tcattttatta	tgctattcaa	gcacaacaaa	ctatggaaca	1320
acaatcaaaa	tgtacgctta	tccggtgccg	atgatttcga	taatgatcga	tgtgcagaaa	1380
tatttgaact	tacgattttc	actgagcagt	caaagcacgt	tcgcgagtat	cgactctact	1440
ttatttatcg	tttgtgcact	atgtataatc	cacctaattc	cgtgccttgg	ccataaaagc	1500
ccccttcaaa	ttgtatttat	atcagctacc	gtgccaccat	tcgtactttt	cggatcaaga	1560
ttaaaacaga	atccctgcat	gcacagcgaa	atcagctgcg	gtatgcgaaa	cgccgcagga	1620
gcgcagtagc	cgaagtgtac	cgctcactatc	agtgcctagt	ttgtcaataa	aaaattagt	1680
accaagcttg	ggtgcataat	gatgggtgatg	aaagaacgct	caatgcttga	cacgttgcag	1740
gctatctgta	agggtatggt	agttacaggc	acagcccaaa	cggccaattg	ctggtttttt	1800
atccttgatc	cgaacagtag	gaatggtggt	cacggtagt	catatacata	ctcaattgaa	1860
gggggctttt	atggccctaa	ggcgacggaa	ttaggtggta	ttgtacatag	tgcagaaacg	1920
gataaagata	gagtcagtat	tacattcggc	ggaaaacgtc	aaatagaaaa	ataatcataa	1980
ttcccctttg	ctggtttag	atagcagcgg	gcaatttttt	ataaaaattt	gcaaaaattta	2040
aataa						2045

<210> 6
 <211> 3023
 <212> DNA
 <213> *Pasteurella haemolytica*

<400> 6

agaccctatc	taatgataat	gaaatatcat	cattttcgcgt	attcacctgt	tgccttaaca	60
gtgttatttg	ctctttctca	ttcatacggg	gctgcgactg	aaaataaaaa	aatcgaagaa	120
aataacgata	tagctgttct	ggatgaagtt	attgtgacag	agagccatta	tggtcacgaa	180
cgtaaaaacg	aagtaactgg	cttggggaaa	gtagtgaaaa	attatcacga	aatgagtaaa	240
aatcaaattc	ttggtattcg	tgatttaact	cgctatgacc	ctggtatttc	ggtggtggaa	300
caaggtcgcg	gtgcaagtag	tggctatgcc	attcgagggtg	tagataaaaa	ccgtgtcagc	360
ttacttggtg	atgggctacc	accagcgcac	agttatcata	cgctggttca	gatgctaattg	420
gtggtgcaat	taatgagatt	gagtatgaaa	acattcgttc	aattgagtta	agcaaaggag	480
caagttctgc	ggaatatggc	tctggtgcgc	atggtggtgc	tattggtttt	cgtactaaag	540
atcgccagga	tattattaaa	gaggggcagc	attggggcct	acatagtaag	acctcttatg	600
ccagcaaaaa	tagccatttt	tacagtctat	cgagcggct	ggtcaggcgg	gtggttttca	660
agcacttggt	attgcaactc	accgacacgg	taaagagacc	aaaattcatt	ccgaggcaaa	720
tcaattacat	attattcggc	gtataaccgg	ctttcaaaat	cgctacgact	ttaccaatt	780
ccgcacagaa	tgcctcctgg	aggatctttt	tttattgtgg	aagatacttg	ccaacatta	840
gattgtactc	ctcgtgcaag	ggttaagttg	aacgcgataa	tttcccagtc	agaacatttc	900
cgaatatacg	cctggaagag	gcgaaacagc	ttgagattcc	ttatcgact	gagctctcag	960
cccaaagaat	acaccggtaa	agatcgcat	gcaccaaacc	ctttagatta	caagagtaat	1020
tctgttttta	tgaagtttgg	ctatcacttt	acctcgtctc	attatcttgg	cgcatctcac	1080
aagatgatac	aaaacaacgc	acgatatccg	tcactctgcaa	acgccagctt	actatacaaa	1140
agacgatatt	tacttatcac	tttggaaacta	tgtttatcaa	ggggatatta	tttagatggc	1200
ttagtgttca	agccaaggat	cccttatggg	ttgcgcatat	gccatgtgaa	cgtcaccaca	1260
aacgtcgttt	aggattcacc	tataaatata	aaccagagaa	taatcgctgg	ttggatagca	1320

ttaactcgtg cgtacgtgct ttgcgctctc gctgctgtgc tctgagtaaa caagatattg 1380
 aactatatag ccggctacat cgcttgcat ttagcgtgta tccctgtgga gataaaaaatt 1440
 gcggcccgac tttggataaa tctggtctat gtatcgaact gagcgtata attaccaaga 1500
 aaagcatcgt gtcattcatt tagaatttga taaagcgcta aatgctggc aaggcgtatt 1560
 taagcaaacc cacaaactga atttaggctt gggctttgaa tcgattaatc gcttatgac 1620
 atggggatat gactgcccac tataccaaag gccgggtata ccagctaccg cggagagggg 1680
 cttagataa tccatatatt tatcgccgcg atccacgcag tattgaaacg gtatctttgt 1740
 gtaataatac agcggcgaca cttaactgtg acgcgttaaa taaaggcata cgtttgtacc 1800
 tccgctgcac ttaggaacta tagtttatga aggggataat atttagatgg cttagtgttc 1860
 aagcaagcaa ggatccctta tgggttgccg gatatgccat gtgaagtttt tgatgaacgt 1920
 caccacaaac gtcgtttagg attcacacct ataaatatat aaaccagaga ataatcgctg 1980
 gttggatagc attaaactcgt gcgtacgtgc tttgcgctct cgctgctgtg ctgtgagtta 2040
 aacaagatat tgaaacttat agccggctac atcgcttgca ttgtgagcga ttatcctgtg 2100
 gtagtagtaa aaattgcggc ccgacttttg ataaatcttg gtctatgtat cgaacggagc 2160
 gtaataatta ccaagaaaag catcgtgtca ttcattttaga atttgataaa gcgctaaatg 2220
 ctggtcaagg cgtattttaag caaaccacaa aactgaattt aggattgggc tttgaatcga 2280
 ttaattcgct tatggatcat ggggatatga ctgcccaata taccaaaggc cggttatacc 2340
 agctaaccgc gagagggcgt ttagataatc catattttat gccgcgatcc acgcagtatt 2400
 gaaacggtat ctttgtgtaa taatacacgc gcgacactaa ctgtgacgcg ttaaataaag 2460
 gcatacgttt gtacctccgc tgctgcctaa taaatcaaaa gaataaccga gatacggttc 2520
 agtgttggtc caaccagttg cgatggccca ctacgtgaac catcacccta atcaagtttt 2580
 ttggggtcga ggtgccgtaa agcacttaac ctttctgtcg tctcccggtg atgcttaaatt 2640
 tgcagctag tggcaggcag gcacgtcact cctctcggtg atttcaggtg caactgaccg 2700
 gttcttggtg ccacccttga tattaaccgg agtcaattat aaaaacgagt tacgtggagc 2760
 gcaatttata atgtcgatgt cagatactgt aaaactctat attaccgtgg gcagcaatta 2820
 ggtgacaggg ccacggggca agcgaaacca gacgggtacc aattacaccg atttgccgcc 2880
 cccgggagag aaatttcagt taccattcaa agaagtttag agccggccaa aagaaaatac 2940
 aaaaaacgct gaaagtatat tcagcgcggt tttgttgctc taacggatta catacgaatt 3000
 caaatgttt taacggtcgg taa 3023

<210> 7
 <211> 65
 <212> DNA
 <213> *Pasteurella haemolytica*

<400> 7
 cgcttgcaga tttgtaaaaa atttagctaa aatcagacct ggcttgtatt ttagggttat 60
 taatg 65

<210> 8
 <211> 59
 <212> DNA
 <213> *Neisseria gonorrhoeae*

<400> 8
 tttaaaaata aataaaataa taatccttat cattctttaa ttgaatcggg tttgttatg 59

<210> 9
 <211> 71
 <212> DNA

<213> Neisseria meningitidis

<400> 9

gtatttgcaa attgttaaaa ataaataaaa taataatcct tatcattctt taattgaatt 60
gggtttatat g 71

<210> 10

<211> 898

<212> PRT

<213> Pasteurella haemolytica

<400> 10

43
Met Ile Met Lys Tyr His His Phe Arg Tyr Ser Thr Val Ala Leu Thr
1 5 10 15
Val Leu Phe Ala Leu Ser His Ser Tyr Gly Ala Ala Thr Glu Asn Lys
20 25 30
Lys Ile Glu Glu Asn Asn Asp Leu Ala Val Leu Asp Glu Val Ile Val
35 40 45
Thr Glu Ser His Tyr Ala His Glu Arg Gln Asn Glu Val Thr Gly Leu
50 55 60
Gly Lys Val Val Lys Asn Tyr His Glu Met Ser Lys Asn Gln Ile Leu
65 70 75 80
Gly Ile Arg Asp Leu Thr Arg Tyr Asp Pro Gly Ile Ser Val Val Glu
85 90 95
Gln Gly Arg Gly Ala Ser Ser Gly Tyr Ala Ile Arg Gly Val Asp Lys
100 105 110
Asn Arg Val Ser Leu Leu Val Asp Gly Leu Pro Gln Ala His Ser Tyr
115 120 125
His Thr Leu Ser Asp Gly Ala Asn Gly Gly Ala Ile Asn Glu Ile Glu
130 135 140
Tyr Glu Asn Ile Arg Ser Ile Glu Leu Ser Lys Gly Ala Ser Ser Ala
145 150 155 160
Glu Tyr Gly Ser Gly Ala His Gly Gly Ala Ile Gly Phe Arg Thr Lys
165 170 175
Asp Ala Gln Asp Ile Ile Lys Glu Gly Gln His Trp Gly Leu Asp Ser
180 185 190
Lys Thr Ser Tyr Ala Ser Lys Asn Ser His Phe Leu Gln Ile Ala Ala
195 200 205
Ala Gly Glu Ala Gly Gly Phe Glu Ala Leu Val Ile Ala Thr His Arg
210 215 220
His Gly Lys Glu Thr Lys Ile His Ser Glu Ala Asn Lys Leu His Lys
225 230 235 240
Asn Ile Arg Arg Ile Thr Gly Phe Glu Asn Arg Tyr Asp Phe Thr Gln
245 250 255
Ile Pro His Arg Met Pro Pro Gly Gly Ser Phe Phe Ile Val Glu Asp
260 265 270
Thr Cys Pro Thr Leu Asp Cys Thr Pro Arg Ala Arg Val Lys Leu Asn
275 280 285
Arg Asp Asn Phe Pro Val Arg Thr Phe Pro Glu Tyr Thr Pro Glu Glu
290 295 300

Arg Asn Ala Glu Gln Ile Pro Tyr Arg Thr Glu Gln Leu Ser Ala Gln
 305 310 315 320
 Glu Lys Thr Gly Lys Asp Arg Ile Ala Pro Asn Pro Leu Asp Tyr Lys
 325 330 335
 Ser Asn Ser Val Phe Met Lys Phe Gly Tyr His Phe Asn Ser Ser His
 340 345 350
 Tyr Leu Gly Ala Ile Leu Glu Asp Thr Lys Gln Arg Thr Ile Ser Val
 355 360 365
 Ile Cys Lys Arg Gln Leu Thr Ile Gln Lys Thr Ile Leu Thr Tyr His
 370 375 380
 Leu Gly Thr Met Phe Met Lys Gly Ile Ile Phe Arg Trp Leu Ser Val
 385 390 395 400
 Gln Ala Lys Asp Pro Leu Trp Val Ala His Met Pro Cys Glu Val Asp
 405 410 415
 Glu Arg His His Lys Arg Arg Leu Gly Phe Thr Tyr Lys Tyr Lys Pro
 420 425 430
 Glu Asn Asn Arg Trp Leu Asp Ser Ile Asn Ser Cys Val Arg Ala Leu
 435 440 445
 Arg Ser Arg Cys Cys Ala Leu Ser Lys Gln Asp Ile Glu Leu Tyr Ser
 450 455 460
 Arg Leu His Arg Leu His Cys Ser Asp Tyr Pro Val Val Asp Lys Asn
 465 470 475 480
 Cys Gly Pro Thr Leu Asp Lys Ser Trp Ser Met Tyr Arg Thr Glu Arg
 485 490 495
 Asn Asn Tyr Gln Glu Lys His Arg Val Ile His Leu Glu Phe Asp Leu
 500 505 510
 Ala Leu Asn Ala Gly Gln Gly Val Phe Leu Gln Thr His Lys Leu Asn
 515 520 525
 Leu Gly Leu Gly Phe Glu Ser Ile Asn Ser Leu Met Asp His Gly Asp
 530 535 540
 Met Thr Ala Gln Tyr Thr Leu Gly Arg Leu Tyr Gln Leu Pro Arg Arg
 545 550 555 560
 Asp Pro Arg Ser Ile Trp Thr Val Ser Leu Cys Asn Asn Thr Arg Ala
 565 570 575
 Thr Leu Asn Cys Asp Ala Leu Asn Leu Gly Ile Arg Leu Tyr Leu Arg
 580 585 590
 Cys Cys Leu Ile Asn Gln Leu Asn Asn Pro Arg Tyr Gly Ser Val Leu
 595 600 605
 Phe Gln Phe Gly Thr Arg Val His Arg Thr Trp Thr Pro Thr Ser Leu
 610 615 620
 Gly Glu Leu Pro Ser Ile Arg Ala Met Ala His Tyr Val Asn His His
 625 630 635 640
 Pro Asn Gln Val Phe Trp Gly Arg Gly Ala Val Lys His Leu Thr Leu
 645 650 655
 Leu Ser Ser Pro Trp Met Leu Lys Phe Ala Ala Ser Gly Arg His Val
 660 665 670
 Thr Leu Ser Val Ile Ser Gly Ala Thr Asp Arg Phe Leu Val Pro Pro
 675 680 685
 Leu Ile Leu Thr Gly Val Asn Tyr Lys Asn Glu Ser Tyr Val Ser Ala
 690 695 700

43

Ile	Tyr	Asn	Val	Asp	Val	Arg	Tyr	Cys	Lys	Thr	Leu	Tyr	Tyr	Arg	Gly
705					710					715					720
Gln	Gln	Leu	Gly	Asp	Arg	Ala	Thr	Gly	Gln	Ala	Lys	Pro	Asp	Gly	Tyr
				725					730					735	
Gln	Leu	His	Arg	Phe	Ala	Ala	Pro	Gly	Arg	Asn	Phe	Ser	Tyr	His	Ser
			740					745					750		
Lys	Lys	Phe	Arg	Pro	Ala	Lys	Glu	Asn	Thr	Lys	Asn	Ala	Glu	Ser	Ile
		755					760					765			
Phe	Ser	Ala	Phe	Phe	Val	Gly	Ser	Asn	Gly	Leu	His	Thr	Asn	Ser	Lys
	770					775					780				
Ser	Cys	Phe	Asn	Gly	Arg	Leu	His	Glu	Pro	Ile	Pro	Tyr	Phe	Phe	Asn
785					790				795						800
Phe	Leu	Arg	Asn	Val	Pro	Arg	Phe	Asn	Glu	Tyr	His	Cys	Cys	Cys	Thr
			805						810					815	
Ser	Leu	Ile	Ala	Ala	Ser	Ile	Leu	Leu	His	His	Ile	Tyr	His	Trp	Val
			820					825						830	
Phe	Asp	Phe	Arg	Tyr	Tyr	Tyr	Phe	Val	Tyr	Phe	Cys	Trp	Ile	Leu	His
		835					840					845			
His	Leu	Ile	His	Ile	Asn	Ser	Phe	Leu	Met	Leu	Leu	Ser	His	Tyr	Arg
	850				855						860				
Glu	Val	Val	Tyr	Leu	Thr	Cys	Cys	Ala	Cys	Ala	Phe	Asn	Ile	Val	Thr
865					870					875					880
Val	Asn	Gly	Phe	Cys	Val	Gly	Cys	Cys	Ser	Asn	Ile	Leu	Ala	Glu	Met
				885					890					895	

Lys Phe

43

<210> 11
 <211> 917
 <212> PRT
 <213> Neisseria gonorrhoeae

<400> 11

Met	Gln	Gln	Gln	His	Leu	Phe	Arg	Leu	Asn	Ile	Leu	Cys	Leu	Ser	Leu
1				5					10					15	
Met	Thr	Ala	Leu	Pro	Ala	Tyr	Ala	Glu	Asn	Val	Gln	Ala	Gly	Gln	Ala
			20					25					30		
Gln	Glu	Lys	Gln	Leu	Asp	Thr	Ile	Gln	Val	Lys	Ala	Lys	Lys	Gln	Lys
		35					40					45			
Thr	Arg	Arg	Asp	Asn	Glu	Val	Thr	Gly	Leu	Gly	Lys	Leu	Val	Lys	Thr
	50					55					60				
Ala	Asp	Thr	Leu	Ser	Lys	Glu	Gln	Val	Leu	Asp	Ile	Arg	Asp	Leu	Thr
65					70					75				80	
Arg	Tyr	Asp	Pro	Gly	Ile	Ala	Val	Val	Glu	Gln	Gly	Arg	Gly	Ala	Ser
				85					90					95	
Ser	Gly	Tyr	Ser	Ile	Arg	Gly	Met	Asp	Lys	Asn	Arg	Val	Ser	Leu	Thr
			100					105					110		
Val	Asp	Gly	Leu	Ala	Gln	Ile	Gln	Ser	Tyr	Thr	Ala	Gln	Ala	Ala	Leu
		115					120						125		

Gly Gly Thr Arg Thr Ala Gly Ser Ser Gly Ala Ile Asn Glu Ile Glu
 130 135 140
 Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Ser Asn Ser Val
 145 150 155 160
 Glu Gln Gly Ser Gly Ala Leu Ala Gly Ser Val Ala Phe Gln Thr Lys
 165 170 175
 Thr Ala Asp Asp Val Ile Gly Glu Gly Arg Gln Trp Gly Ile Gln Ser
 180 185 190
 Lys Thr Ala Tyr Ser Gly Lys Asn Arg Gly Leu Thr Gln Ser Ile Ala
 195 200 205
 Leu Ala Gly Arg Ile Gly Gly Ala Glu Ala Leu Leu Ile Arg Thr Gly
 210 215 220
 Arg His Ala Gly Glu Ile Arg Ala His Glu Ala Ala Gly Arg Gly Val
 225 230 235 240
 Gln Ser Phe Asn Arg Leu Ala Pro Val Asp Asp Gly Ser Lys Tyr Ala
 245 250 255
 Tyr Phe Ile Val Glu Glu Glu Cys Lys Asn Gly Gly His Glu Lys Cys
 260 265 270
 Lys Ala Asn Pro Lys Lys Asp Val Val Gly Glu Asp Lys Arg Gln Thr
 275 280 285
 Val Ser Thr Arg Asp Tyr Thr Gly Pro Asn Arg Phe Leu Ala Asp Pro
 290 295 300
 Leu Ser Tyr Glu Ser Arg Ser Trp Leu Phe Arg Pro Gly Phe Arg Phe
 305 310 315 320
 Glu Asn Lys Arg His Tyr Ile Gly Gly Ile Leu Glu Arg Thr Gln Gln
 325 330 335
 H³ Thr Phe Asp Thr Arg Asp Met Thr Val Pro Ala Phe Leu Thr Lys Ala
 340 345 350
 Val Phe Asp Ala Asn Gln Lys Gln Ala Gly Ser Leu Arg Gly Asn Gly
 355 360 365
 Asn His Lys Tyr Ala Gly Asn His Lys Tyr Gly Gly Leu Phe Thr Ser
 370 375 380
 Gly Glu Asn Asn Ala Pro Val Gly Ala Glu Tyr Gly Thr Gly Val Phe
 385 390 395 400
 Tyr Asp Glu Thr His Thr Lys Ser Arg Tyr Gly Leu Glu Tyr Val Tyr
 405 410 415
 Thr Asn Ala Asp Lys Asp Thr Trp Ala Asp Tyr Ala Arg Leu Ser Tyr
 420 425 430
 Asp Arg Gln Gly Ile Gly Leu Asp Asn His Phe Gln Gln Thr His Cys
 435 440 445
 Ser Ala Asp Gly Ser Asp Lys Tyr Cys Arg Pro Ser Ala Asp Lys Pro
 450 455 460
 Phe Ser Tyr Tyr Lys Ser Asp Arg Val Ile Tyr Gly Glu Ser His Lys
 465 470 475 480
 Leu Leu Gln Ala Ala Phe Lys Lys Ser Phe Asp Thr Ala Lys Ile Arg
 485 490 495
 His Asn Leu Ser Val Asn Leu Gly Tyr Asp Arg Phe Gly Ser Asn Leu
 500 505 510
 Arg His Gln Asp Tyr Tyr Tyr Gln Ser Ala Asn Arg Ala Tyr Ser Leu
 515 520 525

Lys Thr Pro Pro Gln Asn Asn Gly Lys Lys Thr Ser Pro Asn Gly Arg
 530 535 540
 Glu Lys Asn Pro Tyr Trp Val Ser Ile Gly Arg Gly Asn Val Val Thr
 545 550 555 560
 Arg Gln Ile Cys Leu Phe Gly Asn Asn Thr Tyr Thr Asp Cys Thr Pro
 565 570 575
 Arg Ser Ile Asn Gly Lys Ser Tyr Tyr Ala Ala Val Arg Asp Asn Val
 580 585 590
 Arg Leu Gly Arg Trp Ala Asp Val Gly Ala Gly Leu Arg Tyr Asp Tyr
 595 600 605
 Arg Ser Thr His Ser Asp Asp Gly Ser Val Ser Thr Gly Thr His Arg
 610 615 620
 Thr Leu Ser Trp Asn Ala Gly Ile Val Leu Lys Pro Ala Asp Trp Leu
 625 630 635 640
 Asp Leu Thr Tyr Arg Thr Ser Thr Gly Phe Arg Leu Pro Ser Phe Ala
 645 650 655
 Glu Met Tyr Gly Trp Arg Ser Gly Asp Lys Ile Lys Ala Val Lys Ile
 660 665 670
 Asp Pro Glu Lys Ser Phe Asn Lys Glu Ala Gly Ile Val Phe Lys Gly
 675 680 685
 Asp Phe Gly Asn Leu Glu Ala Ser Trp Phe Asn Asn Ala Tyr Arg Asp
 690 695 700
 Leu Ile Val Arg Gly Tyr Glu Ala Gln Ile Lys Asp Gly Lys Glu Gln
 705 710 715 720
 Val Lys Gly Asn Pro Ala Tyr Leu Asn Ala Gln Ser Ala Arg Ile Thr
 725 730 735
 Gly Ile Asn Ile Leu Gly Lys Ile Asp Trp Asn Gly Val Trp Asp Lys
 740 745 750
 Leu Pro Glu Gly Trp Tyr Ser Thr Phe Ala Tyr Asn Arg Val Arg Val
 755 760 765
 Arg Asp Ile Lys Lys Arg Ala Asp Arg Thr Asp Ile Gln Ser His Leu
 770 775 780
 Phe Asp Ala Ile Gln Pro Ser Arg Tyr Val Val Gly Ser Gly Tyr Asp
 785 790 795 800
 Gln Pro Glu Gly Lys Trp Gly Val Asn Gly Met Leu Thr Tyr Ser Lys
 805 810 815
 Ala Lys Glu Ile Thr Glu Leu Leu Gly Ser Arg Ala Leu Leu Asn Gly
 820 825 830
 Asn Ser Arg Asn Thr Lys Ala Thr Ala Arg Arg Thr Arg Pro Trp Tyr
 835 840 845
 Ile Val Asp Val Ser Gly Tyr Tyr Thr Val Lys Lys His Phe Thr Leu
 850 855 860
 Arg Ala Gly Val Tyr Asn Leu Leu Asn His Arg Tyr Val Thr Trp Glu
 865 870 875 880
 Asn Val Arg Gln Thr Ala Ala Gly Ala Val Asn Gln His Lys Asn Val
 885 890 895
 Gly Val Tyr Asn Arg Tyr Ala Ala Pro Gly Arg Asn Tyr Thr Phe Ser
 900 905 910
 Leu Glu Met Lys Phe
 915

<210> 12
<211> 908
<212> PRT
<213> Neisseria meningitidis

<400> 12

Met Gln Gln Gln His Leu Phe Arg Leu Asn Ile Leu Cys Leu Ser Leu
1 5 10 15
Met Thr Ala Leu Pro Val Tyr Ala Glu Asn Val Gln Ala Glu Gln Ala
20 25 30
Gln Glu Lys Gln Leu Asp Thr Ile Gln Val Lys Ala Lys Lys Gln Lys
35 40 45
Thr Arg Arg Asp Asn Glu Val Thr Gly Leu Gly Lys Leu Val Lys Ser
50 55 60
Ser Asp Thr Leu Ser Lys Glu Gln Val Leu Asn Ile Arg Asp Leu Thr
65 70 75 80
Arg Tyr Asp Pro Gly Ile Ala Val Val Glu Gln Gly Arg Gly Ala Ser
85 90 95
Ser Gly Tyr Ser Ile Arg Gly Met Asp Lys Asn Arg Val Ser Leu Thr
100 105 110
Val Asp Gly Val Ser Gln Ile Gln Ser Tyr Thr Ala Gln Ala Ala Leu
115 120 125
43 Gly Gly Thr Arg Thr Ala Gly Ser Ser Gly Ala Ile Asn Glu Ile Glu
130 135 140
Tyr Glu Asn Val Lys Ala Val Glu Ile Ser Lys Gly Ser Asn Ser Ser
145 150 155 160
Glu Tyr Gly Asn Gly Ala Leu Ala Gly Ser Val Ala Phe Gln Thr Lys
165 170 175
Thr Ala Ala Asp Ile Ile Gly Glu Gly Lys Gln Trp Gly Ile Gln Ser
180 185 190
Lys Thr Ala Tyr Ser Gly Lys Asp His Ala Leu Thr Gln Ser Leu Ala
195 200 205
Leu Ala Gly Arg Ser Gly Gly Ala Glu Ala Leu Leu Ile Tyr Thr Lys
210 215 220
Arg Arg Gly Arg Glu Ile His Ala His Lys Asp Ala Gly Lys Gly Val
225 230 235 240
Gln Ser Phe Asn Arg Leu Val Leu Asp Glu Asp Lys Lys Glu Gly Gly
245 250 255
Ser Gln Tyr Arg Tyr Phe Ile Val Glu Glu Glu Cys His Asn Gly Tyr
260 265 270
Ala Ala Cys Lys Asn Lys Leu Lys Glu Asp Ala Ser Val Lys Asp Glu
275 280 285
Arg Lys Thr Val Ser Thr Gln Asp Tyr Thr Gly Ser Asn Arg Leu Leu
290 295 300
Ala Asn Pro Leu Glu Tyr Gly Ser Gln Ser Trp Leu Phe Arg Pro Gly
305 310 315 320
Trp His Leu Asp Asn Arg His Tyr Val Gly Ala Val Leu Glu Arg Thr
325 330 335

Gln Gln Thr Phe Asp Thr Arg Asp Met Thr Val Pro Ala Tyr Phe Thr
 340 345 350
 Ser Glu Asp Tyr Val Pro Gly Ser Leu Lys Gly Leu Gly Lys Tyr Ser
 355 360 365
 Gly Asp Asn Lys Ala Glu Arg Leu Phe Val Gln Gly Glu Gly Ser Thr
 370 375 380
 Leu Gln Gly Ile Gly Tyr Gly Thr Gly Val Phe Tyr Asp Glu Arg His
 385 390 395 400
 Thr Lys Asn Arg Tyr Gly Val Glu Tyr Val Tyr His Asn Ala Asp Lys
 405 410 415
 Asp Thr Trp Ala Asp Tyr Ala Arg Leu Ser Tyr Asp Arg Gln Gly Ile
 420 425 430
 Asp Leu Asp Asn Arg Leu Gln Gln Thr His Cys Ser His Asp Gly Ser
 435 440 445
 Asp Lys Asn Cys Arg Pro Asp Gly Asn Lys Pro Tyr Ser Phe Tyr Lys
 450 455 460
 Ser Asp Arg Met Ile Tyr Glu Glu Ser Arg Asn Leu Phe Gln Ala Val
 465 470 475 480
 Phe Lys Lys Ala Phe Asp Thr Ala Lys Ile Arg His Asn Leu Ser Ile
 485 490 495
 Asn Leu Gly Tyr Asp Arg Phe Lys Ser Gln Leu Ser His Ser Asp Tyr
 500 505 510
 Tyr Leu Gln Asn Ala Val Gln Ala Tyr Asp Leu Ile Thr Pro Lys Lys
 515 520 525
 Pro Pro Phe Pro Asn Gly Ser Lys Asp Asn Pro Tyr Arg Val Ser Ile
 530 535 540
 Gly Lys Thr Thr Val Asn Thr Ser Pro Ile Cys Arg Phe Gly Asn Asn
 545 550 555 560
 Thr Tyr Thr Asp Cys Thr Pro Arg Asn Ile Gly Gly Asn Gly Tyr Tyr
 565 570 575
 Ala Ala Val Gln Asp Asn Val Arg Leu Gly Arg Trp Ala Asp Val Gly
 580 585 590
 Ala Gly Ile Arg Tyr Asp Tyr Arg Ser Thr His Ser Glu Asp Lys Ser
 595 600 605
 Val Ser Thr Gly Thr His Arg Asn Leu Ser Trp Asn Ala Gly Val Val
 610 615 620
 Leu Lys Pro Phe Thr Trp Met Asp Leu Thr Tyr Arg Ala Ser Thr Gly
 625 630 635 640
 Phe Arg Leu Pro Ser Phe Ala Glu Met Tyr Gly Trp Arg Ala Gly Glu
 645 650 655
 Ser Leu Lys Thr Leu Asp Leu Lys Pro Glu Lys Ser Phe Asn Arg Glu
 660 665 670
 Ala Gly Ile Val Phe Lys Gly Asp Phe Gly Asn Leu Glu Ala Ser Tyr
 675 680 685
 Phe Asn Asn Ala Tyr Arg Asp Leu Ile Ala Phe Gly Tyr Glu Thr Arg
 690 695 700
 Thr Gln Asn Gly Gln Thr Ser Ala Ser Gly Asp Pro Gly Tyr Arg Asn
 705 710 715 720
 Ala Gln Asn Ala Arg Ile Ala Gly Ile Asn Ile Leu Gly Lys Ile Asp
 725 730 735

Trp	His	Gly	Val	Trp	Gly	Gly	Leu	Pro	Asp	Gly	Leu	Tyr	Ser	Thr	Leu
			740					745					750		
Ala	Tyr	Asn	Arg	Ile	Lys	Val	Lys	Asp	Ala	Asp	Ile	Arg	Ala	Asp	Arg
		755					760					765			
Thr	Phe	Val	Thr	Ser	Tyr	Leu	Phe	Asp	Ala	Val	Gln	Pro	Ser	Arg	Tyr
	770					775					780				
Val	Leu	Gly	Leu	Gly	Tyr	Asp	His	Pro	Asp	Gly	Ile	Trp	Gly	Ile	Asn
785					790					795					800
Thr	Met	Phe	Thr	Tyr	Ser	Lys	Ala	Lys	Ser	Val	Asp	Glu	Leu	Leu	Gly
				805					810					815	
Ser	Gln	Ala	Leu	Leu	Asn	Gly	Asn	Ala	Asn	Ala	Lys	Lys	Ala	Ala	Ser
			820					825					830		
Arg	Arg	Thr	Arg	Pro	Trp	Tyr	Val	Thr	Asp	Val	Ser	Gly	Tyr	Tyr	Asn
		835					840					845			
Ile	Lys	Lys	His	Leu	Thr	Leu	Arg	Ala	Gly	Val	Tyr	Asn	Leu	Leu	Asn
	850					855					860				
Tyr	Arg	Tyr	Val	Thr	Trp	Glu	Asn	Val	Arg	Gln	Thr	Ala	Gly	Gly	Ala
865					870					875					880
Val	Asn	Gln	His	Lys	Asn	Val	Gly	Val	Tyr	Asn	Arg	Tyr	Ala	Ala	Pro
				885					890					895	
Gly	Arg	Asn	Tyr	Thr	Phe	Ser	Leu	Glu	Met	Lys	Phe				
			900					905							

43
 <210> 13
 <211> 604
 <212> PRT
 <213> Pasteurella haemolytica

<400> 13

Met	Ile	Met	Lys	Tyr	His	His	Phe	Arg	Tyr	Ser	Thr	Val	Ala	Leu	Thr
1				5					10					15	
Val	Leu	Phe	Ala	Leu	Ser	His	Ser	Tyr	Gly	Ala	Ala	Thr	Glu	Asn	Lys
			20					25					30		
Lys	Ile	Glu	Glu	Asn	Asn	Asp	Leu	Ala	Val	Leu	Asp	Glu	Val	Ile	Val
		35					40					45			
Thr	Glu	Ser	His	Tyr	Ala	His	Glu	Arg	Gln	Asn	Glu	Val	Thr	Gly	Leu
	50					55					60				
Gly	Lys	Val	Val	Lys	Asn	Tyr	His	Glu	Met	Ser	Lys	Asn	Gln	Ile	Leu
65					70					75					80
Gly	Ile	Arg	Asp	Leu	Thr	Arg	Tyr	Asp	Pro	Gly	Ile	Ser	Val	Val	Glu
			85					90						95	
Gln	Gly	Arg	Gly	Ala	Ser	Ser	Gly	Tyr	Ala	Ile	Arg	Gly	Val	Asp	Lys
			100					105					110		
Asn	Arg	Val	Ser	Leu	Leu	Val	Asp	Gly	Leu	Pro	Gln	Ala	His	Ser	Tyr
		115					120					125			
His	Thr	Leu	Ser	Gly	Asp	Ala	Asn	Gly	Gly	Ala	Ile	Asn	Glu	Ile	Glu
	130					135					140				
Tyr	Glu	Asn	Ile	Arg	Ser	Ile	Glu	Leu	Ser	Lys	Gly	Ala	Ser	Ser	Ala
145					150					155					160

Glu Tyr Gly Ser Gly Ala His Gly Gly Ala Ile Gly Phe Arg Thr Lys
 165 170 175
 Asp Ala Gln Asp Ile Ile Lys Glu Gly Gln His Trp Gly Leu Asp Ser
 180 185 190
 Lys Thr Ser Tyr Ala Ser Lys Asn Ser His Phe Leu Gln Ile Ala Ala
 195 200 205
 Ala Gly Glu Ala Gly Gly Phe Glu Ala Leu Val Ile Ala Thr His Arg
 210 215 220
 His Gly Lys Glu Thr Lys Ile His Ser Glu Ala Asn Lys Leu Lys His
 225 230 235 240
 Asn Ile Arg Arg Ile Thr Gly Phe Glu Asn Arg Tyr Asp Phe Thr Gln
 245 250 255
 Ile Pro His Arg Met Pro Pro Gly Gly Ser Phe Phe Ile Val Glu Asp
 260 265 270
 Thr Cys Pro Thr Leu Asp Cys Thr Pro Arg Ala Arg Val Lys Leu Asn
 275 280 285
 Arg Asp Asn Phe Pro Val Arg Thr Phe Pro Glu Tyr Thr Pro Glu Glu
 290 295 300
 Arg Asn Ala Glu Gln Ile Pro Tyr Arg Thr Glu Gln Leu Ser Ala Gln
 305 310 315 320
 Glu Lys Thr Gly Lys Asp Arg Ile Ala Pro Asn Pro Leu Asp Tyr Lys
 325 330 335
 Ser Asn Ser Val Phe Met Lys Phe Gly Tyr His Phe Asn Ser Ser His
 340 345 350
 Tyr Leu Gly Ala Ile Leu Glu Asp Thr Lys Gln Arg Thr Ile Ser Val
 355 360 365
 Ile Cys Lys Arg Gln Leu Thr Ile Gln Lys Thr Ile Leu Thr Tyr His
 370 375 380
 Leu Gly Thr Met Phe Met Lys Gly Ile Ile Phe Arg Trp Leu Ser Val
 385 390 395 400
 Gln Ala Lys Asp Pro Leu Met Val Ala His Met Pro Cys Glu Val Asp
 405 410 415
 Glu Arg His His Lys Arg Arg Leu Gly Phe Thr Tyr Lys Tyr Lys Pro
 420 425 430
 Glu Asn Asn Arg Trp Leu Asp Ser Ile Asn Ser Cys Val Arg Ala Leu
 435 440 445
 Arg Ser Arg Cys Cys Ala Leu Ser Lys Gln Asp Ile Glu Leu Tyr Ser
 450 455 460
 Arg Leu His Arg Leu His Cys Ser Asp Tyr Pro Val Val Asp Lys Asn
 465 470 475 480
 Cys Gly Pro Thr Leu Asp Lys Ser Trp Ser Met Tyr Arg Thr Glu Arg
 485 490 495
 Asn Asn Tyr Gln Glu Lys Ala Thr Cys His Ser Phe Cys Ile Leu Lys
 500 505 510
 Ala Leu Asn Ala Gly Gln Gly Val Phe Lys Gln Thr His Lys Leu Asn
 515 520 525
 Leu Gly Leu Gly Phe Glu Ser Asn Leu Ile Arg Leu Thr Ile Ile Gly
 530 535 540
 Ile Ile Leu Pro Asn Ile Pro Lys Ala Gly Tyr Thr Ser Tyr Arg Gly
 545 550 555 560

43

Arg Gly Arg Leu Asp Asn Pro Tyr Ile Tyr Arg Arg Asp Pro Arg Ser
565 570 575
Ile Glu Thr Val Ser Leu Cys Asn Asn Thr Arg Ala Thr Leu Leu Leu
580 585 590
Leu Arg Val Asn Lys Gly Ile Arg Leu Leu Leu Arg
595 600

<210> 14
<211> 593
<212> PRT
<213> Actinobacillus pleuropneumoniae

<400> 14

Met His Phe Lys Leu Asn Pro Tyr Ala Leu Ala Phe Thr Ser Leu Phe
1 5 10 15
Leu Val Ala Cys Ser Gly Gly Lys Gly Ser Phe Asp Leu Glu Asp Val
20 25 30
Arg Pro Asn Gln Thr Ala Lys Ala Glu Lys Ala Thr Thr Ser Tyr Gln
35 40 45
Asp Glu Glu Thr Lys Lys Lys Thr Lys Glu Glu Leu Asp Lys Leu Met
50 55 60
Glu Pro Ala Leu Gly Tyr Glu Thr Gln Ile Leu Arg Arg Asn Lys Ala
65 70 75 80
H3 Pro Lys Thr Glu Thr Gly Glu Lys Arg Asn Glu Arg Val Val Glu Leu
85 90 95
Ser Glu Asp Lys Ile Thr Lys Leu Tyr Gln Glu Ser Val Glu Ile Ile
100 105 110
Pro His Leu Asp Glu Leu Asn Gly Lys Thr Thr Ser Asn Asp Val Tyr
115 120 125
His Ser His Asp Ser Lys Arg Leu Asp Lys Asn Arg Asp Leu Lys Tyr
130 135 140
Val Arg Ser Gly Tyr Val Tyr Asp Gly Ser Phe Asn Glu Ile Arg Arg
145 150 155 160
Asn Asp Ser Gly Phe His Val Phe Lys Gln Gly Ile Asp Gly Tyr Val
165 170 175
Tyr Tyr Leu Gly Val Thr Pro Ser Lys Glu Leu Pro Lys Gly Lys Val
180 185 190
Ile Ser Tyr Lys Gly Thr Trp Asp Phe Val Ser Asn Ile Asn Leu Glu
195 200 205
Arg Glu Ile Asp Gly Phe Asp Thr Ser Gly Asp Gly Lys Asn Val Ser
210 215 220
Ala Thr Ser Ile Thr Glu Thr Val Asn Arg Asp His Lys Val Gly Glu
225 230 235 240
Lys Leu Gly Asp Asn Glu Val Lys Gly Val Ala His Ser Ser Glu Phe
245 250 255
Ala Val Asp Phe Asp Asn Lys Lys Leu Thr Gly Ser Leu Tyr Arg Asn
260 265 270
Gly Tyr Ile Asn Arg Asn Lys Ala Gln Glu Val Thr Lys Arg Tyr Ser
275 280 285

43
 Ile Glu Ala Asp Ile Ala Gly Asn Arg Phe Arg Gly Lys Ala Lys Ala
 290 295 300
 Glu Lys Ala Gly Asp Pro Ile Phe Thr Asp Ser Asn Tyr Leu Glu Gly
 305 310 315 320
 Gly Phe Tyr Gly Pro Lys Ala Glu Glu Met Ala Gly Lys Phe Phe Thr
 325 330 335
 Asn Asn Lys Ser Leu Phe Ala Val Phe Ala Ala Lys Ser Glu Asn Gly
 340 345 350
 Glu Thr Thr Thr Glu Arg Ile Ile Asp Ala Thr Lys Ile Asp Leu Thr
 355 360 365
 Gln Phe Asn Ala Lys Glu Leu Asn Asn Phe Gly Asp Ala Ser Val Leu
 370 375 380
 Ile Ile Asp Gly Gln Lys Ile Asp Leu Ala Gly Val Asn Phe Lys Asn
 385 390 395 400
 Ser Lys Thr Val Glu Ile Asn Gly Lys Thr Met Val Ala Val Ala Cys
 405 410 415
 Cys Ser Asn Leu Glu Tyr Met Lys Phe Gly Gln Leu Trp Gln Lys Glu
 420 425 430
 Gly Lys Gln Gln Val Lys Asp Asn Ser Leu Phe Leu Gln Gly Glu Arg
 435 440 445
 Thr Ala Thr Asp Lys Met Pro Ala Gly Gly Asn Tyr Lys Tyr Val Gly
 450 455 460
 Thr Trp Asp Ala Leu Val Ser Lys Gly Thr Asn Trp Ile Ala Glu Ala
 465 470 475 480
 Asp Asn Asn Arg Glu Ser Gly Tyr Arg Thr Glu Phe Asp Val Asn Phe
 485 490 495
 Ser Asp Lys Lys Val Asn Gly Lys Leu Phe Asp Lys Gly Gly Val Asn
 500 505 510
 Pro Val Phe Thr Val Asp Ala Thr Ile Asn Gly Asn Gly Phe Ile Gly
 515 520 525
 Ser Ala Lys Thr Ser Asp Ser Gly Phe Ala Leu Asp Ala Gly Ser Ser
 530 535 540
 Gln His Gly Asn Ala Val Phe Ser Asp Ile Lys Val Asn Gly Gly Phe
 545 550 555 560
 Tyr Gly Pro Thr Ala Gly Glu Leu Gly Gly Gln Phe His His Lys Ser
 565 570 575
 Asp Asn Gly Ser Val Gly Ala Val Phe Gly Ala Lys Arg Gln Ile Glu
 580 585 590
 Lys

<210> 15

<211> 547

<212> PRT

<213> Actinobacillus pleuropneumoniae

<400> 15

Met His Phe Lys Leu Asn Pro Tyr Ala Leu Ala Phe Thr Ser Leu Phe
 1 5 10 15

Leu Val Ala Cys Ser Gly Gly Lys Gly Ser Phe Asp Leu Glu Asp Val
 20 25 30
 Arg Pro Asn Lys Thr Thr Gly Val Ser Lys Glu Glu Tyr Lys Asp Val
 35 40 45
 Glu Thr Ala Lys Lys Glu Lys Glu Gln Leu Gly Glu Leu Met Glu Pro
 50 55 60
 Ala Leu Gly Tyr Val Val Lys Val Pro Val Ser Phe Glu Asn Lys
 65 70 75 80
 Lys Val Asp Ile Ser Asp Ile Glu Val Ile Thr Asn Gly Asn Leu Asp
 85 90 95
 Asp Val Pro Tyr Lys Ala Asn Ser Ser Lys Tyr Asn Tyr Pro Asp Ile
 100 105 110
 Lys Thr Lys Asp Ser Ser Leu Gln Tyr Val Arg Ser Gly Tyr Val Ile
 115 120 125
 Asp Gly Glu His Ser Gly Ser Asn Glu Lys Gly Tyr Val Tyr Tyr Lys
 130 135 140
 Gly Asn Ser Pro Ala Lys Glu Leu Pro Val Asn Gln Leu Leu Thr Tyr
 145 150 155 160
 Thr Gly Ser Trp Asp Phe Thr Ser Asn Ala Asn Leu Asn Asn Glu Glu
 165 170 175
 Gly Arg Pro Asn Tyr Leu Asn Asp Asp Tyr Tyr Thr Lys Phe Ile Gly
 180 185 190
 Lys Arg Val Gly Leu Val Ser Gly Asp Ala Lys Pro Ala Lys His Lys
 195 200 205
 Tyr Thr Ser Gln Phe Glu Val Asp Phe Ala Thr Lys Lys Met Thr Gly
 210 215 220
 Lys Leu Ser Asp Lys Glu Lys Thr Ile Tyr Thr Val Asn Ala Asp Ile
 225 230 235 240
 Arg Gly Asn Arg Phe Thr Gly Ala Ala Thr Ala Ser Asp Lys Asn Lys
 245 250 255
 Gly Lys Gly Glu Ser Tyr Asn Phe Phe Ser Ala Asp Ser Gln Ser Leu
 260 265 270
 Glu Gly Gly Phe Tyr Gly Pro Lys Ala Glu Glu Met Ala Gly Lys Phe
 275 280 285
 Val Ala Asn Asp Lys Ser Leu Phe Ala Val Phe Ser Ala Lys His Asn
 290 295 300
 Gly Ser Asn Val Asn Thr Val Arg Ile Ile Asp Ala Ser Lys Ile Asp
 305 310 315 320
 Leu Thr Asn Phe Ser Ile Ser Glu Leu Asn Asn Phe Gly Asp Ala Ser
 325 330 335
 Val Leu Ile Ile Asp Gly Lys Lys Ile Lys Leu Ala Gly Ser Gly Phe
 340 345 350
 Thr Asn Lys His Thr Ile Glu Ile Asn Gly Lys Thr Met Val Ala Val
 355 360 365
 Ala Cys Cys Ser Asn Leu Glu Tyr Met Lys Phe Gly Gln Leu Trp Gln
 370 375 380
 Gln Ala Glu Gly Gly Lys Pro Glu Asn Asn Ser Leu Phe Leu Gln Gly
 385 390 395 400
 Glu Arg Thr Ala Thr Asp Lys Met Pro Lys Gly Gly Asn Tyr Lys Tyr
 405 410 415

A3

Ile	Gly	Thr	Trp	Asp	Ala	Gln	Val	Ser	Lys	Glu	Asn	Asn	Trp	Val	Ala
			420					425					430		
Thr	Ala	Asp	Asp	Asp	Arg	Lys	Ala	Gly	Tyr	Arg	Thr	Glu	Phe	Asp	Val
		435					440					445			
Asp	Phe	Gly	Asn	Lys	Asn	Leu	Ser	Gly	Lys	Leu	Phe	Asp	Lys	Asn	Gly
	450					455					460				
Val	Asn	Pro	Val	Phe	Thr	Val	Asp	Ala	Lys	Ile	Asp	Gly	Asn	Gly	Phe
465					470					475					480
Thr	Gly	Lys	Ala	Lys	Thr	Ser	Asp	Glu	Gly	Phe	Ala	Leu	Asp	Ser	Gly
				485					490					495	
Ser	Ser	Arg	Tyr	Glu	Asn	Val	Lys	Phe	Asn	Asp	Val	Ala	Val	Ser	Gly
		500						505					510		
Gly	Phe	Tyr	Gly	Pro	Thr	Ala	Ala	Glu	Leu	Gly	Gly	Gln	Phe	His	His
	515					520						525			
Lys	Ser	Glu	Asn	Gly	Ser	Val	Gly	Ala	Val	Phe	Gly	Ala	Lys	Gln	Gln
	530					535					540				
Val	Lys	Lys													
545															

<210> 16
 <211> 7
 <212> PRT
 <213> Pasteurella haemolytica

<400> 16
 Asp Glu Val Ile Val Thr Glu
 1 5

<210> 17
 <211> 7
 <212> PRT
 <213> Escherichia coli

<400> 17
 Glu Thr Met Val Val Thr Ala
 1 5

<210> 18
 <211> 7
 <212> PRT
 <213> Escherichia coli

<400> 18
 Asp Thr Ile Val Val Thr Ala
 1 5

<210> 19
<211> 7
<212> PRT
<213> Escherichia coli

<400> 19
Asp Thr Ile Thr Val Thr Ala
1 5

<210> 20
<211> 7
<212> PRT
<213> Escherichia coli

<400> 20
Phe Thr Leu Ser Val Asp Ala
1 5

H3
<210> 21
<211> 330
<212> DNA
<213> Pasteurella haemolytica

<400> 21
attttttatc taatctaaaa acaagcggtt ccaccttgga aatgattaac atgacacctga 60
aactaataaa gttcaaacct ttacattaag tttatattat aaattataat gattattatt 120
ttataaatta aaggagacat tatgtttaaa cttaaaagta gttttgtact ggaaaaataa 180
tcataattcc cctttgctgg ttgtagatag caagcgggca attttttata aaaatttgca 240
aaatttaaat aaaggagacc ctatctaagt ataatgaaat atcatcattt tcgcagaaat 300
ttcagtttag catttgaaat gaagtttttag 330

<210> 22
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide primer

<400> 22
ggaagcttac tgaaaataaaa aaaatcgaag aa

32

<210> 23
<211> 21
<212> DNA
<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 23

ggaattcccg tcctgtggat c

21

<210> 24

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 24

gtgaattccg gcgtagagga tc

22

<210> 25

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 25

ggaagcttac tgaaaataaa aaaatcgaag aa

32

<210> 26

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 26

cactactttc cccaagccag

20

<210> 27

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 27

ggaattccct cctgtggatc

20

<210> 28

43

<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<221> misc_feature
<222> 3
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 6
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 7
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 9
<223> modified nucleotide "i" or inosine

H³
<221> misc_feature
<222> 12
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 15
<223> modified nucleotide "i" or inosine

<223> Oligonucleotide primer

<400> 28
gcngcnnsng cncgnaaytw y

21

<210> 29
<211> 22
<212> DNA
<213> Pasteurella haemolytica

<220>
<221> misc_feature
<222> 11
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 17
<223> modified nucleotide "i" or inosine

<221> misc_feature
<222> 20

<223> modified nucleotide "i" or inosine

<223> Oligonucleotide primer

<400> 29

caaagcttgc ntgytcnggn gg

22

<210> 30

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 30

agatctggat tctaaatcag accgcttgta ttttag

36

<210> 31

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<221> misc_feature

<222> 3

<223> modified nucleotide "i" or inosine

<221> misc_feature

<222> 6

<223> modified nucleotide "i" or inosine

<221> misc_feature

<222> 9

<223> modified nucleotide "i" or inosine

<221> misc_feature

<222> 12

<223> modified nucleotide "i" or inosine

<223> Oligonucleotide primer

<400> 31

gtnwvnggng gnttytaygg

20

<210> 32

<211> 29

<212> DNA

<213> Artificial Sequence

43

<220>

<223> Oligonucleotide primer

<400> 32

taaattaaag gagacattat gtttaaact

29

<210> 33

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 33

cgacgcccacat gggtattttt ctatttgacg ttttcc

36

<210> 34

<211> 28

<212> DNA

<213> Artificial Sequence

H3 <220>

<223> Oligonucleotide primer

<400> 34

gcgcaagctt ttatttttct atttgacg

28

<210> 35

<211> 39

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 35

ggattcagat cttaaaggag accctatcta atgataatg

39

<210> 36

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 36

ccctatcata tgataatgaa atatcatc

28

<210> 37
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide primer

<400> 37
tagcgcaagc ttctaaaact tcatttcaaa t

31

<210> 38
<211> 5
<212> PRT
<213> Pasteurella haemolytica

<400> 38
Tyr Lys Gly Tyr Trp
1 5

43 <210> 39
<211> 5
<212> PRT
<213> Pasteurella haemolytica

<400> 39
Tyr Arg Gly Thr Trp
1 5

<210> 40
<211> 8
<212> PRT
<213> Pasteurella haemolytica

<400> 40
Phe Thr Ala Asp Phe Ala Asn Lys
1 5

<210> 41
<211> 8
<212> PRT
<213> Pasteurella haemolytica

<400> 41
Phe Asp Val Asp Phe Val Asn Lys
1 5

<210> 42
<211> 6
<212> PRT
<213> Pasteurella haemolytica

<400> 42
Gly Asn Arg Phe Ser Gly
1 5

<210> 43
<211> 6
<212> PRT
<213> Pasteurella haemolytica

<400> 43
Gly Asn Gly Phe Gly Gly
1 5

43
<210> 44
<211> 7
<212> PRT
<213> Pasteurella haemolytica

<400> 44
Leu Glu Gly Gly Phe Phe Gly
1 5

<210> 45
<211> 7
<212> PRT
<213> Pasteurella haemolytica

<400> 45
Phe Glu Gly Gly Phe Tyr Gly
1 5

<210> 46
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide primer

<400> 46

ccctatcata tgataatgaa atatcatc

28

<210> 47

<211> 31

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 47

tagcgcaagc ttctaaaact tcatttcaaa t

31

<210> 48

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 48

43 taatgttggg caagtatctt ccac

24

<210> 49

<211> 29

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 49

taaattaaag gagacattat gtttaaact

29

<210> 50

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 50

gcgcaagctt ttatttttct atttgacg

28

<210> 51

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 51

ctgttgga atctgccaga g

21

<210> 52

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide primer

<400> 52

aggtaatcgc ttttctggta aagc

24

<210> 53

<211> 17

<212> PRT

<213> *Pasterurella haemolytica*

<400> 53

Tyr Ala Ile Arg Gly Val Asp Lys Asn Arg Val Ser Leu Leu Val Asp
1 5 10 15
Gly

43

<210> 54

<211> 17

<212> PRT

<213> *Escherichia coli*

<400> 54

Val Ser Ile Arg Gly Leu Asp Ser Ser Tyr Thr Leu Ile Leu Val Asp
1 5 10 15
Gly

<210> 55

<211> 17

<212> PRT

<213> *Escherichia coli*

<400> 55

Ile Asp Ile Arg Gly Met Gly Pro Glu Asn Thr Leu Ile Leu Ile Asp
1 5 10 15

Gly

<210> 56
<211> 19
<212> PRT
<213> Escherichia coli

<400> 56
Leu Ile Ile Arg Gly Phe Ala Ala Glu Gly Gln Ser Gln Asn Asn Tyr
1 5 10 15
Leu Asn Gly

<210> 57
<211> 20
<212> PRT
<213> Escherichia coli

<400> 57
Phe Gly Ile Arg Gly Leu Asn Pro Arg Leu Thr Ser Arg Ser Thr Val
1 5 10 15
Leu Met Asp Gly
20

43
<210> 58
<211> 27
<212> PRT
<213> Pasteurella haemolytica

<400> 58
Ile Glu Leu Ser Lys Gly Ala Ser Ser Ala Glu Tyr Gly Ser Gly Ala
1 5 10 15
His Gly Gly Ala Ile Gly Phe Arg Thr Lys Asp
20 25

<210> 59
<211> 27
<212> PRT
<213> Escherichia coli

<400> 59
Ile Glu Val Val Arg Gly Pro Met Ser Ser Leu Tyr Gly Ser Asp Ala
1 5 10 15
Leu Gly Gly Val Val Asn Ile Ile Thr Lys Lys
20 25

<210> 60
<211> 27
<212> PRT
<213> Escherichia coli

<400> 60
Ile Glu Val Leu Arg Gly Pro Ala Arg Ala Arg Tyr Gly Asn Gly Ala
1 5 10 15
Ala Gly Gly Val Val Asn Ile Ile Thr Lys Lys
20 25

<210> 61
<211> 27
<212> PRT
<213> Escherichia coli

43
<400> 61
Ala Glu Ile Met Arg Gly Pro Val Ser Val Leu Tyr Gly Lys Ser Ser
1 5 10 15
Pro Gly Gly Leu Leu Asn Met Val Ser Lys Arg
20 25

<210> 62
<211> 27
<212> PRT
<213> Escherichia coli

<400> 62
Ile Asp Val Val Arg Gly Gly Gly Ala Val Arg Tyr Gly Pro Gln Ser
1 5 10 15
Val Gly Gly Val Val Asn Phe Val Thr Arg Ala
20 25

<210> 63
<211> 13
<212> PRT
<213> Pasteurella haemolytica

<400> 63
Phe Lys Gln Thr His Lys Leu Asn Leu Gly Leu Gly Phe
1 5 10

<210> 64
<211> 13

<212> PRT
<213> Escherichia coli

<400> 64
Pro Glu Thr Ser Glu Ser Trp Glu Leu Gly Leu Tyr Tyr
1 5 10

<210> 65
<211> 13
<212> PRT
<213> Escherichia coli

<400> 65
Ala Glu Thr Ser Ile Asn Lys Glu Ile Gly Leu Glu Phe
1 5 10

<210> 66
<211> 13
<212> PRT
<213> Escherichia coli

H3
<400> 66
Pro Ser Lys Gly Lys Gln Tyr Glu Val Gly Val Lys Tyr
1 5 10

cond.
<210> 67
<211> 13
<212> PRT
<213> Escherichia coli

<400> 67
Pro Glu Lys Ala Arg Thr Trp Glu Leu Gly Thr Arg Tyr
1 5 10

<210> 68
<211> 8
<212> PRT
<213> Pasteurella haemolytica

<400> 68
Thr Glu Asn Lys Lys Ile Glu Glu
1 5
